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FOREST PEST MANAGEMENT
Pacific Southwest Region

Report No. 82-10

3430 Evaluation
March 22, 1982

UPDATE OF BIOLOGICAL EVALUATION OF BLACK PINELEAF SCALE AT BADGER HILL BREEDING ARBORETUM

Dave Schultz, Entomologist

ABSTRACT

Rust Resistant Sugar Pine at the Badger Hill Breeding Arboretum has been infested with the black pineleaf scale for approximately five years. A suppression project attempted to redu e the infestation level by using malathion during 1979. Gaylord Parks submitted foliage samples in February 1982 and requested an update of the 1979 biological evaluation. Most of the samples had scale levels on the 1981 foliage which are generally acknowleded to be not noticeably damaging to trees.

OBSERVATIONS AND DISCUSSION

The level of black pineleaf scale, Nuculaspis californica, infestation on the samples that Gaylord Parks submitted (Forest Pest Detection Report No. 842), was assessed by randomly selecting a fascicle from the proper age class of foliage (1980 or 1981), counting the number of scales on the most severely infested needle and dividing by the length of the needle. The highest level of infestation on the 1980 needles was 8.4 scales per inch of needle, which is much lower than the 17-33 scales per inch of needle seen in the Arboretum in 1979. A level of 20-30 living scales per inch of needle is generally regarded as being heavy enough to severely affect the health of the tree. The heaviest infestation level seen on the 1981 needles was 4.2 scales per inch of needle, although on most samples, scale density was lower than the 0.5 scale per inch level which is thought to be the threshold at which effects of infestation become visible. (Appendix 1)

The 1981 foliage on the samples submitted appeared quite normal in color and length. A few needles had dead tips due to feeding by Scythropus sp. weevils, but this is not unusual. Most of these needles had no black pineleaf scale and very few had more than one scale per needle.

The 1980 foliage on the samples submitted was much more discolored than the current foliage, due to "weather fleck" and other natural causes. There were more scales on the 1980 foliage than on the 1981 foliage, but the levels were still lower than those seen prior to the control effort in 1979. The scales are relatively shortlived and most of the scales on the 1980 foliage are dead. It appears that the population of living scales is quite low and may be declining.

The Discussion and Management Options sections of the May 2, 1979, biological evaluation report of black pineleaf scale at Badger Hill (Appendix 2) still appear to be valid for the current conditions. If the foliage samples submitted by Gaylord Parks are representative of the current conditions in the Arboretum, then Management Option 2, Promote conditions which will result in increased parasite and predator pressure on the scale population and stimulate tree vigor, would seem to be most appropriate at the present time. Similar alternatives to minimize the impact of the black pineleaf scale are also mentioned in the report from Weddle, Hansen & Associates which summarized the 1979 suppression project. (Appendix 3)

If continued surveillance should show an increase in the scale population in the Arboretum, and if the increased number of scales would interfere with management objectives, then it would be appropriate to select Management Options 3 or 4 from the May 2, 1979 biological evaluation report (Appendix 2). If future conditions should warrant suppression of scales on some or all of the trees in the Arboretum, the materials listed below appear to be suitable, in addition to those included in the May 2, 1979, biological evaluation report.

CLASS AND NAME	EPA REG. NO.	NOTES
Class I		
Di-Syston (Mobay)	3125-172	Granular soil application. Must have soil moisture. Calif. restricted material.
Class II		
Ethion Superior 70 Oil (FMC)	279-1731	Dormant season. Contains Ethion insecticide-acaracide. Calif. restricted material.
Class III		
Scalecide (B.G. Pratt)	904-6	Dormant season oil.
Pratts 7N Superior Oil (B.G. Pratt)	904-68	Dormant season oil.
Michlin 70-E Superior Spray Oil (Michlin)	5285-16	Dormant season oil.
Volck Supreme Spray (Ortho)	239-1736	Dormant season oil.
Pratts Summer Spra-Oil (B.G. Pratt)	904-29	Dormant or foliar oil. 40-85 ^{0}F.
Pratts 6 N Superior Oil (B.G. Pratt)	904-126	Dormant or foliar oil. 40-85 ^{0}F.

APPENDIX 1.

TREE NUMBER	CROWN POSITION	SCALES PER INCH 1980 FOLIAGE	SCALES PER INCH 1981 FOLIAGE
P 12	TOP	2.4	.0
K 23	MID	4.0	0.27
	BOTTOM	4.5	0.6
G 20	TOP	1.1	.0
K 46 U	MID	1.6	.0
	BOTTOM	1.5	0.5
K-16	TOP	2.0	0.23
5008	MID	1.4	.0
	BOTTOM	4.8	0.29
A-22	TOP	0.25	.0
K-9-HC	MID	2.6	.0
	BOTTOM	3.1	.0
T-17	TOP	2.9	.0
K 42	MID	9.0	.0
	BOTTOM	1.25	0.4
D 21	TOP	7.7	4.23
K-79-HC	MID	8.4	0.22
	BOTTOM	5.5	0.44

Appendix 2

UNITED STATES DEPARTMENT OF AGRICULTURE
FOREST SERVICE

R-5

REPLY TO: 3430 FI&DM Evaluation May 2, 1979

SUBJECT: Biological Evaluation of Infestation of Black Pineleaf Needle Scale at Badger Hill Breeding Arboretum

TO: Forest Supervisor, Eldorado N.F.

An infestation of black pineleaf scale (Nuculaspis californica (Coleman)) has been observed for two years at the Badger Hill Breeding Arboretum. The infestation occurs on grafts of sugar pine (Pinus lambertiana) from trees resistant to white pine blister rust, on ponderosa pine (Pinus ponderosa) scattered through the part of the area devoted to culture of the rust-resistant trees, and on Jeffrey pine (Pinus jeffreyi) located near the sugar pine. Arboretum personnel believed that the infestation was becoming heavy and requested a biological evaluation by Forest Insect and Disease Management (FIDM). This evaluation was made on March 28 by Dave Schultz and John Dale, entomologist in FIDM in the company of Gaylord Parks, zone geneticist.

Observations

The heaviest scale infestation was found on approximately 600 rust-resistant sugar pine located near the center of the Arboretum (Fig. 1). These trees were the largest sugar pine in the Arboretum at about 35 ft (11 m). The needles on the lower branches were covered with 17 to 33 scales per inch of needle whereas the density decreased in the mid- and upper-crown. Nearly all scales appeared to be live and the number of holes in scales indicated parasitism to be minimal.

A light infestation occurred on approximately 70 ponderosa pine scattered through the younger sugar pine on the eastern half of the rust-resistant breeding area. There were 5 to 6 scales per inch of needle where they occurred, but many branches bore no scales at all. Similarly, a very light infestation occurred on the 400 or so small sugar pine in tbe breeding area. The number of scales varied from branch to branch, but was usually low, and some trees were almost free of scales.

The Jeffrey pine had some branches with 17 to 25 scales per inch of needle. However, these cannot be said to represent the situation in this portion of the Arboretum as the majority of branches had few scales and the number present decreased with increasing distance from the sugar pine area.

Discussion

The black pineleaf scale is a sucking insect that injures by removing sap and, possibly, by injecting toxic enzymes while feeding on needles. There are one to two generations each year. Both males and females mature during May and the motile males seek out and mate with the immobile females in June. The females produce large numbers of eggs that hatch into "crawlers", which disperse to suitable feeding sites by either crawling or being transported by air currents, birds and possibly larger flying insects. It is during this stage that chemical control is most feasible with minimal effects on parasites. Once situated the crawlers loose their appendages with the first molt and become immobile. They then secrete over themselves a waxy covering that enlarges with subsequent molts to accommodate growth and this covering is the visible sign of infestation. The inpenetrability of this covering makes chemical treatment of "non-crawlers" by contact insecticides a futile endeavor with adverse effects on parasites and predators.

Populations of the black pineleaf scale can be designated as light, up to 0.5 scale per inch of needle length; or heavy 20 to 30 scales per inch. Light populations as seen on the small sugar pine and the ponderosa and Jeffrey pine do not noticeably damage trees with normal healthy foliage. These light infestations can help create a source of future balance by providing a food source for parasite and predator populations should heavier infestations receive treatment with insecticides.

Heavy populations such as those on the larger sugar pine ultimately will reduce the number, length and retention period of the needles should high population levels persist for several years. Radial and terminal growth may be reduced. In severe cases, death may result if the needle compliment is sufficiently reduced in quantity and vigor. However, natural enemies and climate are important checks on this scale and populations usually collapse unless some environmental conditions (usually man-made) preclude the influence of these checks.

The present problem with this scale began with the drought years and it is likely that decreased tree vigor along with increased and prolonged exposure to dust from nearby roads resulted in this localized outbreak. Reduction of dust levels should be considered. Irrigation and fertilization would maintain tree vigor despite the infestation and would allow the eventual build-up of parasites and predators while the effects of the scales are checked. No chemical treatment for control of aphids or other insects should be conducted as such treatment would adversely affect the parasitoids of the scales while having no effect of the scale.

Now that the drought has ended tree vigor should increase and loss of needles from heavy scale infestation probably will be delayed despite the absence of pressure on the scale population from parasites and predators. Thus, symptoms other than increased yellowing and scale buildup may not be visible for one or two more years, by which time natural control factors may have come into play. However, the rust resistant sugar pine in the Arboretum are managed primarily for flower production, but the relationship of black pineleaf scale to sugar pine flower production is unknown. While Arboretum personnel feel that sugar pine flower production has been reduced due to the scale infestation, it was noted that other tree species, zero to lightly infested with scale, have a poor or absent cone crop this year.also.

Management Options

1. Take no action. The infestation will continue until natural enemies and environmental conditions check the buildup and initiate population decline. Trees will be lost, but incompatability of grafts probably will be the cause. Effects on flower production cannot be foretold given the absence of research data and the cyclic nature of flowering, but production probably will be low until the trees recover.

2. Promote conditions which will result in increased parasite and predator pressure on the scale population and stimulate tree vigor. The infestation will continue as mentioned in No. 1, but the reduction in dust levels will enhance natural control factors. Tree vigor will be less affected by the presence of scales if irrigation is included, and thus there may be a greater chance of flower production.

3. Chemically treat only large sugar pine with heavy infestation of scales. Application of insecticide to the crawler stage will end the infestation, but will not prevent another buildup if similar conditions should arise. Effects of the insects on flower production will disappear, but flower production will not be assured given the cyclic nature of flowering.

4. Chemically treat all trees with scales. Scales on the small sugar pine and the Jeffrey and ponderosa pine are not abundant. Thus, considerable cost in time and money will occur without measureable benefits to other than the larger sugar pine.

Should an alternative involving chemical treatment be chosen, a list of potential insecticides is attached. The listed insecticides appear to be suitable for control of the black pineleaf scale according to the latest EPA interpretation of the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA).

If you have questions concerning this evaluation or if we can be of further assistance, please contact John Dale at (415) 556-4321.

David E. Schultz

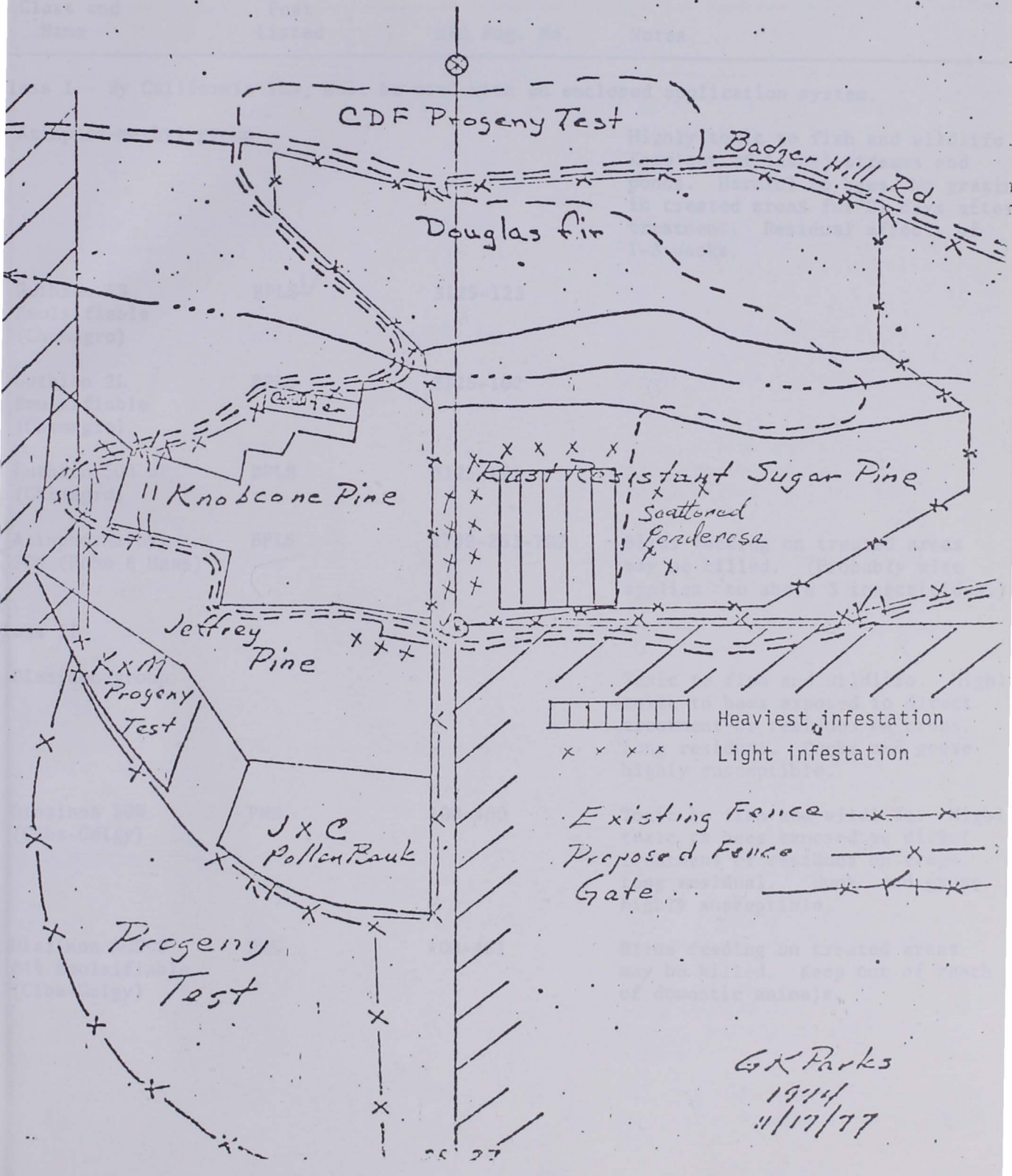
for WILFRED L. FREEMAN, JR., Director
Forest Insect and Disease Management

Enclosures
1. List of insecticides
2. Data on these insecticides

cc: Srago
FIDM, WO
Gaylord Parks, Placerville Nursery
Hank Switzer, Chico Tree Improvement Center

JWDale:sdj

Badger Hill Breeding Arboretum Fence



G K Parks
1974
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CANDIDATE INSECTICIDES

Class and Name	Pest Listed	EPA Reg. No.	Notes
Class I - By California law, must be used with an enclosed application system.			
Azinphos-methyl group			Highly toxic to fish and wildlife. Keep out of lakes, streams and ponds. Harmful to bees. No grazin in treated areas for 21 days after treatment. Residual effects of 1-3 weeks.
Guthion 2S Emulsifiable (Chemagro)	BPLS[1/]	3125-123	
Guthion 2L Emulsifiable (Chemagro)	BPLS	3125-102	
Guthion 50% WP (Chemagro)	BPLS	3125-193	
AzinphosMethyl 50W (Rohm & Haas)	BPLS	2749-263-707	Birds feeding on treated areas may be killed. (Probably also applies to above 3 insecticides.)
Class II			
Diazinon group			Toxic to fish and wildlife. Highl toxic to bees exposed to direct treatment or residues on crops. Long residual. Ducks and geese highly susceptible.
Diazinon 50W (Ciba-Geigy)	PNS	100-460	Toxic to fish and wildlife. Highl toxic to bees exposed to direct treatment or residues on crops. Long residual. Duck and geese highly susceptible.
Diazinon AG500 84% Emulsifiable (Ciba-Geigy)	PNS	100-461	Birds feeding on treated areas may be killed. Keep out of reach of domestic animals.

CANDIDATE INSECTICIDES

Class and Name	Pest Listed	EPA Reg. No.	Notes
Diazinon AG4E Emulsifiable (Pratt)	PNSC	904-206	Toxic to fish and wildlife. Birds feeding on treated areas may be killed. Highly toxic to bees.
Diazinon AG4 Thompson-Hayward)	PNSC	148-1137	Toxic to fish and wildlife. Birds feeding on treated areas may be killed. Highly toxic to bees.
Diazinon 4E (Ciba-Geigy)	PNSC	100-463	Toxic to fish and wildlife. Birds feeding on treated areas may be killed. Highly toxic to bees.
Diazinon 4EC (Pratt)	PNSC	904-211	Toxic to fish and wildlife. Birds feeding on treated areas may be killed. Highly toxic to bees.
Diazinon E4 (Thompson-Hayward)	PNSC	148-1130	Toxic to fish and wildlife. Birds feeding on treated areas may be killed. Highly toxic to bees.
Oxydemeton-Methyl group			
Meta-Systox-R Spray Concentrate (Chemagro)	PNS	3125-111	Toxic to fish and wildlife. Birds feeding on treated areas may be killed. Keep out of streams and ponds.
Carbophenothion group			Toxic to bees; long residual effect.
Trithion 4E 45% Emulsion (Stauffer)	BS	476-1376	Toxic to fish and wildlife; birds feeding on treated areas may be killed.
Trithion 8E 79% Emulsion (Stauffer)	BS	476-1633	Toxic to fish and wildlife; birds feeding on treated areas may be killed.
Trithion 25-WP (Stauffer)	BS	476-1087	Toxic to fish and wildlife; birds feeding on treated areas may be killed.

CANDIDATE INSECTICIDES

Class and Name	Pest Listed	EPA Reg. No.	Notes
Class III			
Carbaryl group			Breaks down in sunlight. Toxicity increases with increasing temperature. Used to chemically thin apples. Toxic to bees.
			Relation to pH Carbaryl pH — Half life 6 — 100-150 days 7 — 24- 30 days 8 — 2- 3 days 9 — up to 1 day
Sevin Sprayable 80% (Union-Carbide)	S	1016-43	Do not apply when foliage is wet or when rain or excessive humidity is expected in the next 2 days.
Sevimol 4 (Union-Carbide)	S	1016-68	Do not apply when foliage is wet or when rain or excessive humidity is expected in the next 2 days.
Sevin 50% (Pratt)	S	904-214	Do not apply when foliage is wet or when rain or excessive humidity is expected in the next 2 days.
Sevin 4 Flowable (Stauffer)	S	476-1347	Do not apply when foliage is wet or when rain or excessive humidity is expected in the next 2 days.
Sevin 50-W (Union-Carbide)	S	1016-41	
Malathion group			Toxic to bees and fish. Reacts with heavymmetals, especially iron. Incompatible with alkaline materials. The ULV concentrate may cause spotting on auto paint finish.

CANDIDATE INSECTICIDES

Class and Name	Pest Listed	EPA Reg. No.	Notes
Malathion 5E (Agway)	BSC	8590-36	
Malathion 25 Wettable (FMC)	BSC	279-761	
50% Malathion Spray (Black Leaf)	S	5887-10	
Malathion-50 (Pratt)	PNSC	904-43	
EC Malathion Spray (Pratt) (contains Cythion)	PNSC	904-153	
Malathion EC-5 (contains Cythion) (Michlin)	PNSC	5285-23	
Malathion 25W (Pratt)	BSC PNS	8343-2-904	
Methoxychlor and Kelthane and Malathion			
Pratt 505K (Pratt)	PNSC	904-118	Long residual. Toxic to fish and bees.

1/ BPLS = Black pine leaf scale.
PNS = Pine needle scale.
S = Scale.
BSC = Black scale crawlers.
PNSC = Pine needle scale crawlers.
BS = Black scale.

INSECTICIDE

Common Name: *Azinphosmethyl (Guthion).*

Chemical Group: Organophosphate.

Uses: Fruit, vegetables and ornamentals.

Phytotoxicity: Do not use on hawthorn and American linden (*Tilia americana*).

Compatibility: Not compatible with Bordeaux, lime sulfur, lime, zinc sulfate plus lime. Doubtful physical compatibility with cyprex, oils and wettable sulfur. Reacts with iron and many heavy metal compounds.

Toxicity: Acute oral LD50 13 mg/kg; acute dermal LD50 280 mg/kg.

Hazard: High to the applicator using concentrated materials. Absorbed through skin. Caution should be observed against feed contamination for livestock and drift onto non-registered crops. Can cause spotting of automobile finishes.

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INSECTICIDE

Common Name: *Bidrin.*

Chemical Group: Organophosphate.

Uses: As a systemic applied by Mauget injector in certain ornamental and shade trees.

Phytotoxicity: High. Dosage must be carefully calculated for each tree.

Compatibility: Not usually used with other insecticides.

Toxicity: Acute oral LD50 22 mg/kg; acute dermal LD50 225 mg/kg.

Hazard: High due to the toxicity to the applicator of the concentrated formulation. Implantation limited to those completing BIDRIN course of instruction.

INSECTICIDE

Common Name: *Diazinon.*

Chemical Group: Organophosphate.

Uses: On vegetables, fruit, ornamentals, forage crops and for cockroach control. No systemic action.

Phytotoxicity: Do not use on gardenia, hibiscus, poinsettia, stephanotis, African violets and some mum varieties. Will russet many apple varieties.

Compatibility: Do not use with copper fungicides.

Toxicity: Acute oral LD50 150 mg/kg; acute dermal LD 50 900 mg/kg.

Hazard: Do not use directly on birds or livestock. Applicator should wear protective clothing; absorbed through skin. Ducks and geese are especially susceptible to diazinon.

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INSECTICIDE

Common Name: *Dichlorvos (DDVP, Vapona).*

Chemical Group: Organophosphate.

Uses: As a fumigant because of its volatility. For fly control as a volatile spray, fogger or resin strip; also used in greenhouse and warehouse fogging. Ventilate after 2 hours of greenhouse fogging.

Phytotoxicity: Overdosage may injure many varieties of plants. Do not use on Shasta or some other chrysanthemum varieties.

Compatibility: Not usually mixed with other pesticides; breaks down in the presence of water and alkaline materials.

Toxicity: Acute oral LD50 56 mg/kg; acute dermal LD50 107 mg/kg.

Hazard: Applicator hazard high when handling Dichlorvos concentrates. Absorbed through skin as well as by breathing in vapor. Environmental and drift hazard low.

MITICIDE

Common Name: *Ovex (Ovotran, Chlorfenson).*

Chemical Group: Chlorinated hydrocarbon - sulfonate.

Uses: Mainly an ovicide for mites on fruit trees, nuts and ornamentals.

Phytotoxicity: Usually not a serious problem, but may cause damage to apples and pears at high rates during slow drying conditions. Will injure Chinese holly. Raspberry injury reported.

Compatibility: Do not mix wettable forms with other materials in the EC form or vice versa.

Toxicity: Acute oral LD50 about 2000 mg/kg.

Hazard: Very little hazard to humans or animals.

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INSECTICIDE

Common Name: *Oxydemetonmethyl (Meta-Systox-R).*

Chemical Group: Organophosphate.

Uses: As a contact and plant systemic insecticide for use on vegetables and ornamentals. Can be applied to leaves or as soil drench.

Phytotoxicity: Will injure some ornamentals.

Compatibility: Do not use with alkaline materials.

Toxicity: Acute oral LD50 65 mg/kg; acute dermal LD50 100 mg/kg.

Hazard: When applied as a leaf spray Meta-systox-R is of some hazard to the applicator. Protective clothing and a respirator should be worn. Meta-systox-R is highly toxic to honey bees.

Hazard: High oral toxicity. Should be handled carefully and applied by trained people.

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INSECTICIDE

Common Name: *Carbophenothion (Trithion).*

Chemical Group: Organophosphate.

Uses: As a soil treatment and on certain fruit and vegetables. Not systemic. Not effective on thrips, grasshoppers and roaches. Ovicidal on mites and many insect eggs.

Phytotoxicity: May cause serious injury on apples and greenhouse roses.

Compatibility: Generally good; unlike most organophosphorus compounds carbophenothion is compatible with lime-sulfur, lime and other alkaline materials. A ten day interval between application of dinitro compounds and carbophenothion is recommended.

Toxicity: Acute oral LD50 30 mg/kg; acute dermal LD50 800 mg/kg.

Hazard: Generally high due to the toxicity of the compound to the applicator and the persistence of the chemical. Absorbed through the skin. Do not feed treated crops to livestock.

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MITICIDE

Common Name: *Chlorbenside (Mitox).*

Chemical Group: Chlorinated hydrocarbon-chloro phenyl sulfide.

Uses: Chlorbenside is a specific residual miticide which is active against the eggs and immature stages of the two-spotted mite and the European red mite. It is ineffective against adult mites at temperatures below 70° F. Not effective on all mite species.

Phytotoxicity: Low: Delicious apple fruit may be damaged. Do not use on plants of the squash family (cucurbits) or on certain rose varieties.

Compatibility: Compatible with other pesticides including alkaline materials. Do not use with oil on apples and pears; do not use post-bloom on apples or grapes.

Toxicity: Acute oral LD50 2000 mg/kg.

INSECTICIDE

Common Name: *Carbaryl (Sevin)*

Chemical Group: Carbamate.

Uses: As a residual, contact and stomach poison insecticide. Not effective against sucking insects. Spray application equipment must have continuous agitation. General usage in field, forage, vegetable groups, livestock insects, and poultry houses.

Phytotoxicity: Low. Will cause leaf drop of cotoneaster and Boston ivy; severe leaf spotting on Cortland and McIntosh apples; and thinning of fruit. May retard grass germination. May injure watermelon.

Compatibility: Not compatible with lime, Bordeaux mixture, lime-sulfur or other alkaline materials. When mixing Sevin wettable powder with emulsifiable concentrates and other pesticides, small batches should be tested first to make sure they are physically compatible.

Toxicity: Acute oral LD50 400 mg/kg; acute dermal LD50 500 mg/kg.

Hazard: Usually low. Carbaryl, however, is extremely poisonous to bees and every attempt should be made to safeguard them. Carbaryl is not effective against mites and these may build up after the use of carbaryl. Do not use on fruit trees at blossom time if these are to be thinned with another chemical.

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INSECTICIDE

Common Name: *Carbofuran (Furadan)*

Chemical Group: Carbamate - systemic.

Uses: Broad spectrum insecticide-systemic-very effective on soil insects.

Phytotoxicity: Still under test in many crops.

Compatibility: Do not mix with alkaline products. Compatible with commonly used fungicides and miticides.

Toxicity: Acute oral LD50 (for 10G) 132 mg/kg; acute

Common Name: *Lindane (99% Gamma isomer of BHC).*

Chemical Group: Chlorinated hydrocarbon, cyclodiene type insofar as the resistance spectrum of many insects is concerned.

Uses: As a powerful stomach and contact insecticide with fumigant properties. On fruit, ornamentals, and some household wood attacking insects.

Phytotoxicity: Do not use on squashes and other cucurbits and hydrangeas; injury reported on potatoes and walnuts. Will give off-flavor to many crops and vegetables. May slow germination and growth (especially with overdoses).

Compatibility: Not compatible with lime, lime sulfur or calcium arsenate. Will corrode aluminum.

Toxicity: Acute oral LD50 200 mg/kg; acute dermal LD50 750 mg/kg.

Hazard: Low to applicator. Absorbed through skin. Drift and general environmental contamination of food crops, forage and livestock are to be avoided. Not to be used on poultry and dairy cattle. Not as persistently stored in animal tissues as many of the chlorinated hydrocarbons. Vaporizers--may kill household fish and birds. Vaporizers cannot be used in homes, sleeping quarters or areas where food or feed may be contaminated.

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INSECTICIDE

Common Name: *Malathion.*

Chemical Group: Organophosphate.

Uses: Generally safe, broad-spectrum organophosphate; contact action. On fruit, vegetables, ornamentals, forage, livestock and poultry, fly control.

Phytotoxicity: Do not use on ferns, crassulas, sweet pea, snapdragons, orchids. May injure certain varieties of apples, pears, cranberries, sweet cherries, grapes and string beans. Will spot fruit of nectarines.

Compatilibity: Do not use with alkaline materials. Reacts with heavy metals, especially iron.

Toxicity: Acute oral LD50 1650 mg/kg; dermal LD50 4000 mg/

Hazard: Generally low when used as directed. Applicator caution necessary when using concentrated form. Concentrate will spot automobile finishes.

INSECTICIDE

Common Name: *Methomyl (Lannate).*

Chemical Group: Carbamate.

Uses: Broad spectrum material very effective for control of insects, caterpillars in the moth and butterfly group, particularly corn ear worm and some loopers.

Toxicity: Acute oral LD50 17 mg/kg; acute dermal (rabbit) greater than 1500 mg/kg.

Hazard: Highly hazardous to applicators. Follow all label precautions.

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INSECTICIDE

Common Name: *Methoxychlor (Marlate).*

Chemical Group: Chlorinated hydrocarbon - DDT type.

Uses: As a contact stomach poison similar to DDT. Does not accumulate in animal's body to the same extent as DDT. Used on fruit, vegetables and ornamentals. Not effective on aphids or mites.

Phytotoxicity: Low.

Compatibility: Do not use with alkaline materials. Do not use with any product incompatible with oil. Do not apply within 14 days of a sulfur or lime-sulfur application.

Toxicity: Acute oral LD50 5000 mg/kg; acute dermal LD50 6000 mg/kg.

Hazard: General hazard low. Possible milk contamination resulting from overdosage in dairy animals. Poisonous to fish and fish food.

Appendix 3

UNITED STATES DEPARTMENT OF AGRICULTURE
FOREST SERVICE
Placerville Nursery

D: 3440 Suppression August 10, 1979

RECD. AUG 15 1979
FOREST PEST CONTROL

T: Control of Black Pineleaf Scale
Badger Hill Breeding Arboretum

D: Regional Forester
Attn: FIDM

For your information we are submitting a copy of the data collected by Weddle, Hansen & Associates for the work they accomplished at Badger Hill in connection with the Black Pineleaf Scale infestation.

While it appears the malathion spray accomplished a reduction in numbers of insects it remains to be seen if long term control will result. We are anxious to build on this data and monitor the insect activity. Your comments on future control options mentioned by Weddle are solicited.

William Scheuner

WILLIAM H. SCHEUNER
Nursery Superintendent

Attachment

A.P.C.A. Lic. Nos. 3569 & 6080

WEDDLE, HANSEN & Associates

AGRICULTURAL CONSULTANTS

2486 RISING HILL ROAD • PLACERVILLE • CALIFORNIA 95667 • TELEPHONE 916/622-9061

August 3, 1979

Mr. William Scheuner
Mr. Gaylord Parks
U.S.D.A.-Forest Service
2375 Fruitridge Road
Camino, California 95709

8 9 79
NURSERY MO. DAY YR.
Nurseryman WS
Prod. Asst
Entomologist

Gentlemen:

Enclosed are the results of the eight surveys contracted for the monitoring of Black Pineleaf Scale, Nuculaspis californica (Coleman) at the Badger Hill Seed Cone Plantation.

Samples were taken on 6/8, 15, 19, 22, 25, 7/2, 11, 25. Each sample consisted of at least 20 new shoots from the lower to mid center of the crowns of the more heavily infested mature sugar pines. Samples taken on 7/11 and 7/25 consisted of 2 samples, one from trees sprayed on 6/25 and the other from trees sprayed on 7/2. Shoots were inspected under 20X magnification for the presence of crawlers and new scale non-motile forms. In addition, 100 mature female scales from 20 needles were examined for the presence of eggs and crawlers.

Prior to 6/19, few new motile forms were seen (see Table I). Between 6/19 and 6/25 a substantial increase in scale crawlers was observed and the recommendation for spray application was made. A Malathion spray was applied on 6/25 through 7/2. Samples taken on 7/2 from the area sprayed on 6/25 showed no live crawlers on new fasicles while only 15 live crawlers were found on 20 old, heavily infested needles, a 75-90% reduction from the pre-spray levels. Later samples showed new scale crawlers reinfesting new needles. Trees sprayed early showed more reinvading crawlers on 7/25 than the latter sprayed trees. Parasitism prior to spraying ranged from approximately 2-5% and the Coccinellid predator Adalia bipunctata was easily observed. No parasites or predators were observed after the spray.

The spray appears to have controlled emerged crawlers to acceptable levels during the month after application. However, reinvasion of crawlers could be a problem, especially if the crawler emergence is prolonged or if subsequent scale generations occur.

The literature on this insect suggests that two factors elevate it to pest status; (1) chemical sprays either directly applied to the pine trees or indirectly applied through drift which disrupt parasites and predators of the scale, or (2) dusty conditions which disrupt these controlling beneficial species. Both factors have occurred at Badger Hill which probably explain the scale outbreak.

Future control of this pest may be difficult. Alternatives to annual summer sprays should be explored including spraying with winter oil, methods of dust suppression, injections of chemicals, and introductions of parasites and predators.

Thank you for your interest in our assistance with this problem and for your cooperation. If we can be of further use in this or other pest problems, please contact us.

Sincerely,

Patrick Weddle

Patrick Weddle

Table I. Results of Monitoring Observations on Black Pineleaf Scale, *Nuculaspis californica* (Coleman) at the Badger Hill Seed Cone Plantation, Pollock Pines, California, 1979.

Date		Per 20 New Fasicles		Per 100 Females Per 20 Needles	
		# Crawlers	# New Scale	# Egg Masses	# Crawlers
6/8		0	0	0	0
6/15		0	0	0	14
6/19		0	0	3	7
6/22		5	2	1	70
6/25[a]		43	39	0	165
7/2[b]		0	dead	0	15
7/11[c]	early spray	0	3	0	10
	late spray	0	10	0	12
7/25	early spray	20	140	0	6
	late spray	0	2	0	0

a Spray begun, sample taken from unsprayed trees

b Spray completed, sample taken from trees sprayed 6/25

c Two samples taken, one each from trees sprayed 6/25 and 7/2